TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 9, 1895.

The President, ROBERT ABBE, M.D., in the Chair.

SURGICAL RELATIONS OF THE NEW, SMALL-CALIBRE RIFLES (MANNLICHER SYSTEM).

DR. A. G. GERSTER exhibited to the society a new, small-calibre rifle, which he had recently imported, saying that it was of importance on account of the very important part which such weapons were likely to play in the next war. All the large European armies have been provided with such rifles, and the United States army and navy also are being furnished with them. When this weapon was used for the first time in the field, which was during the Revolutionary war in Peru, a number of reports were made, according to which it was to be presumed that the effects upon the human frame were not as destructive as those of the older rifle, although it was stated that the projectile shot from this rifle would put out of service a larger number of men, because the magazine could be fired very rapidly, and it carried much farther than the old-fashioned rifles. It has since been shown, however, that this weapon is infinitely more destructive in all regards than the older one.

To make one comparison between the two, it has been observed by war surgeons as not at all a rare occurrence for the bullet, fired from the ordinary gun, to glance off of a large vessel, or push it to one side, without injuring it or destroying its utility ; with this new weapon such a thing is utterly impossible. If the projectile from it comes in the slightest contact with a vessel, the utility of that vessel is absolutely destroyed. The consequence of this will be that a great many more soldiers will die on the battle-field from hæmorrhage due to injuries inflicted upon the large vessels.

As regards the effect upon bone, it has also been found that the destructive effect of this weapon is infinitely greater. This fact is explained by the structure of the weapon itself and by the ammunition used.

Of late years there has been observable a tendency towards the reduction of the calibre of rifles. The reason for this is the fact that, given the same amount of driving power in the explosive, while at the same time reducing the transverse section of the projectile without diminishing its weight, the velocity is very much increased, —that is, the smaller the transverse diameter of the bullet with the same weight and the same amount of powder, the more rapidly is the projectile driven. But this fact was not of much practical effect until a new powder was discovered, a powder made principally of cellulose. Among the first attempts to manufacture this wood-powder for sporting purposes some were made in this country also, but it was so imperfect as to act as a detonator, with the consequence that the weapon was frequently shattered.

The Belgian, Wetteren, finally produced a powder which had all the advantages of a very rapidly-exploding powder, without being detonating, a so-called smokeless powder, which will produce twice as great an effect, weight for weight, as the old powder. In order to get the full benefit of this, it was necessary to increase the resistance of the projectile to being driven out of the barrel by the explosion of the powder, and that was accomplished by making the projectile somewhat larger than the calibre of the barrel whereby it was driven with great force into the riflings, and the full explosive effect of the powder was gotten out of the weapon. But it was noticed that lead bullets either did not take to the riflings at all, or if they did they so clogged these as to interfere very much with the usefulness of the weapon. Therefore experiments were made with projectiles of a different material, notably steel. This was found to take the riflings, being less easily shaped than lead, its power of penetration was very much greater, but it had the great drawback of being lighter than lead, which caused it to lose its velocity sooner. Finally, a shell was used, composed of an alloy of nickel and steel, which took readily to the riflings, was hard enough to prevent stripping, and which could be filled with chilled lead in order to give it the necessary weight. The projectile used in the Austrian army has a calibre of eight millimetres. Prussia has one of seven millimetres and a fraction, while Roumania is going to use a projectile of 6.5 millimetres in diameter. While the old weapon had a twist in the rifling of three-quarters of one complete turn, this new rifle has three complete turns in a shorter barrel, one twenty-eight to thirty inches in length. If, then, one takes into consideration the fact that the projectile is one-tenth of a millimetre greater in diameter than the calibre of the rifle, he will understand what a great amount of resistance is offered the highly-explosive powder, and will recognize the fact that the projectile must leave the rifled barrel with tremendous force and speed. This will be best appreciated when it is stated that, whereas formerly the greatest initial velocity of the bullet shot off with black powder was 800 feet, sometimes, possibly, 1000 feet, per second, this new bullet travels about 2000 feet during the same period, and makes 2660 revolutions around its own longitudinal axis during the first second.

DR. GERSTER presented some plates showing the results of a large number of experiments with the gun, made by a commission appointed by the German government. The experiments were made upon fresh cadavers, upon dry bones, upon living animals, etc. Although the bullet is a very hard one, yet when it comes in contact with a hard body at its higher rates of speed, it is completely shattered or more or less deformed, which, of course, adds greatly to its destructive effect. When it strikes a receptacle containing a fluid, or the skull containing the brain, which is a semifluid substance as it were, that receptacle is completely shattered. This remark applies to the liver, the spleen, the heart in diastole, but not in systole. But when it strikes an empty receptacle, as the skull from which the brain has been removed, it makes simply a clean entrance and exit, and does not shatter the body. The exit aperture is somewhat larger than the entrance. If the gut is hit by the bullet it is always torn. The lung is the only organ which shows a greater proportion of cures after injury with this new projectile than after the old. The illustrations show that where bone is struck it is shattered, the fragments being carried out of the body along with all tissues which stand in their way. The fragments spread out in the shape of a cone, thus making the aperture through which the bullet leaves the body much larger than when the old weapon was used.

The weapon is much lighter than the old-fashioned ones. The cartridges are furnished in packages of five, and, being lighter in weight, each soldier can carry twice as many of them as of the old form. The package is pressed into the magazine in the stock of the gun, each cartridge as it is fired has the waste shell thrown out by the same quick movement which brings the next cartridge into place.

When the five have been fired, another package is inserted. In a riot in Austria ten soldiers were commanded to fire into the mob, which refused to disperse; the ten bullets wounded thirty-four men, six of whom died on the spot, seven died within a week, the rest recovered. One bullet penetrated on an average four men. Habart, an Austrian military surgeon, has tested the ballistic and other qualities of the projectile, and has found that at a distance of 5600 metres, or more than 5600 yards, the velocity is still seventy-five yards a second, which is just sufficient to kill a man.

TREATMENT OF INJURIES OF THE SPINE AND CORD BY SAYRE'S PLASTER-OF-PARIS JACKET.

DR. F. S. DENNIS read a paper on this subject (see p. 268).

DR. L. S. PILCHER thought one feature connected with treatment of injuries of the spine and cord by laminectomy had not been sufficiently dwelt upon in the discussions which had taken place upon this subject at several meetings of the society during the past year. He referred to the greater mobility of the spine fragments following such operations. In a number of cases of this kind, which had come under his own observation in past years, there had been evidently much greater mobility after the laminectomy than before, the cord being thus constantly exposed to injury. This fact had been so strongly impressed upon his mind as to constitute a controlling reason for desisting from such operative procedure, except in the presence of well-defined indications.

As illustrating the possibility of such damage from laminectomy performed soon after injury, he mentioned a case in which the symptoms were such as to enable him to predict that the bullet must have lodged at a certain point within the spinal canal. He accordingly cut down, exposed the cord, found and removed the bullet, which had entered from in front and to one side, and was embedded in the substance of the cord at the level of the first dorsal vertebra. The injury had been sustained only a few hours before. The patient died within twenty-four or forty-eight hours after the operation. He believed the rapid death to have been due in part, perhaps in large measure, to the additional traumatism of the operation. A similar injury was shown in one of the specimens of Dr. Dennis, where the patient lived seven months, no operation having been performed. It might be of great importance to some people to live this additional seven months.

Experience, then, had led him to the conclusion that the indications for operative interference should be very well marked and of a positive nature before one should undertake it.

Dr. Charles K. Briddon said he had recently read an article bearing on the question raised by Dr. Pilcher as to liability of undue mobility of the spine following laminectomy. The author, whose name he could not recall, took the ground that such danger need not be apprehended. Dr. Briddon thought it was probably the extravagant opinion of one of the advocates of the bloody method of treating these cases. For his own part he could hardly conceive how the removal of from four to six or more spinous processes of the vertebræ could do otherwise than render the spine unnaturally mobile. He had seen quite a number of such cases in his own hands or in that of others, and he could not recall one recovery. He would refer to a case of gunshot wound of an upper cervical vertebra in a young woman who was brought to the hospital completely paralyzed in both upper and lower extremities. He operated immediately, removing spiculæ of bone, etc., but the bullet was not found. Not a great deal of damage had been done the cord, although the canal had been opened by the bullet. The patient lay in the hospital about a year and then was taken out by friends to die. It was only by extreme care that, up to the time she left the hospital, she had escaped cystitis, pyelitis, etc. One group of muscles of the forearm acquired ability to respond to pricking, but there was practically no restoration of motor function.

Dr. Briddon thought that in the future he would become an ardent advocate of the treatment recommended by Dr. Dennis, immobilization of the spine by plaster of Paris. If there were only fracture of the spinous processes, it was plain that an operation should be resorted to, but in a large proportion of the cases there was also injury of the body of the vertebræ, and while at least one surgeon had been bold enough to advocate resection of these, he did not know whether it had yet been done. Again, he had seen learned neurologists locate the lesion at some spot in the cord, and operation fail to confirm the opinion. He would not feel certain unless a neuropathologist should tell him where the lesion was, and then he should not place a great deal of reliance upon it.

While applying the plaster jacket, reliance should not be placed alone upon the assistants to support the point of injury by making traction upon the extremities, as these rested upon supports. There should also, he thought, be a tripod or support of some kind to prevent accidental sagging at the point of fracture.

DR. GEORGE WOOLSEY recalled two cases of spinal hæmorrhage, one with, the other without apparent fracture-dislocation. These cases were treated on the expectant plan with all possible care, but the unsatisfactory results obtained had almost converted him to the employment of operative treatment in the future in such cases, although he was opposed to it in the majority of cases of fracture. The spontaneous improvement, which set in after a limited period during which the symptoms increased, soon ceased and left the patients permanent cripples. He could not say what would have been the result of treatment by the plaster-of-Paris jacket and stretching, yet in the future he should be inclined to try it in cases where hæmorrhage was a marked feature and which were not subjected to operation.

In a third case of simple fracture of the spine treated by the application of a plaster jacket without stretching, marked improvement, though not an absolute cure, had resulted, so that the patient could go about with support.

DR. ROBERT ABBE said he had at former meetings expressed himself in opposition to operative interference in fracture of the spine except in rare cases, such as where the lesion could be clearly located and it seemed probably an operation would be successful in relieving pressure. The paper read by Dr. Dennis had convinced him further of the limitations of operative interference. He believed we should try pretty universally treatment by the plaster-of-Paris jacket and extension. He regarded extension as an important part of the procedure, since it in all probability acted in some degree towards reducing the deformity, relieving pressure, and restoring the spine to its normal curve.

It was his opinion that, ordinarily, when the bodies of the vertebræ were intact, laminectomy would not impair the strength of the spine. He had performed the operation a number of times, and had never been able to recognize the slightest difference in the suppleness of the spine.

DR. DENNIS said he had purposely avoided the subject of laminectomy on this occasion. It was for the benefit of that class of cases in which no operation was justifiable, and which were usually left to die, that he had advocated the use of plaster of Paris. The method of applying the jacket in order to avoid risk of sagging at the point of injury during the procedure was described. He had been much surprised to learn what proportion of cases treated by this method had recovered, although they had before suffered loss of both motion and sensation. The man whom he had presented at the last meeting had been completely paralyzed for seven months, and when he applied the jacket he had no idea that the patient would ever walk again, yet within three months he was able to move about on crutches, and had since returned to business.

STENOSIS OF APERTURE OF CHOLECYSTENTEROSTOMY TEN MONTHS AFTER OPERATION BY MURPHY'S BUTTON.

DR. ROBERT ABBE presented a specimen consisting of a part of the intestine, gall-duct, and neighboring tissues, which he had been able to secure in the case reported a few weeks ago of cholecystenterostomy on a woman who had cancer involving the head of the pancreas and first part of the gall-duct, causing obstruction and distention of the gall-bladder. About a year ago he had opened the gall-bladder when she was almost moribund, and established a bile fistula through which there escaped about a pint of bile a day for six weeks. At the end of this time the patient's condition had greatly improved. He then established anastomosis by Murphy's button between the gall-bladder and duodenum, the button passing on the twelfth day. The patient remained in perfect health until eight weeks ago. She then had an attack with symptoms of gall-stone colic, He had mentioned the fact to the society a few weeks ago, and had expressed the opinion that it was likely stenosis was taking place. She had a third attack, went into profound cholæmia, and died in convulsions after two days. The specimen sent him by the physician who made the autopsy showed cancer of the head of the pancreas, with obstruction thereby of the common duct. The disease had crept up a little and obstructed the cystic duct. The opening created between the gall-bladder and duodenum had become absolutely stenosed by cicatricial contraction, ten months after its establishment by a half-inch Murphy button. The stenosed part was tested by distention with fluids and was found to be quite tight, permitting none of the fluid to pass. Replying to interrogatories, Dr. Abbe said the malignant disease had not invaded the anastomosed parts, but was located an inch and a half to two inches distant.

Dr. A. G. Gerster remarked that he did not think it was necessary to assume that there was malignant infiltration to account for the stenosis. It had been stated that there was also stenosis of the cystic duct. Before this occurred the flow of bile would tend to prevent contraction at the point of anastomosis, but afterwards the natural tendency would be to occlusion, as was the rule with tracts thrown out of physiological use, especially if embarrassed by circular cicatricial deposit.

Dr. Abbe said he had had this point in mind, but it was found that while the bile was not passing into the gall-bladder, still, this organ was distended by its own secretions.

Dr. Willy Meyer suggested that the secretion and distention in the gall-bladder were consecutive to the shrinking of the artificial channel of communication between the gall-bladder and duodenum, the constriction having resulted from cessation of bile-flow, and this again from occlusion of the cystic duct by the cancer. The mucous secretion afterwards distended the bladder. The *vis a tergo* from the side of an accumulation of mucus distending the gall-bladder cannot be equal to that of the continuously running bile. He thought the point raised by Dr. Gerster was an important one, that the shrinkage at the site of anastomosis was due to want of physiological use, the passage of bile to this point having been prevented in the cystic duct. This accident had not occurred in any of the numerous cases before reported, and the explanation mentioned seemed to him the probable one. He would add that his first patient operated upon with the help of Murphy's button, a case of resection of the pylorus for benignant stricture and insertion of the cut end of the duodenum into the posterior wall of the stomach, was perfectly well to-day, ten months after the operation. She had gained forty pounds and could partake of all kinds of food without the slightest annoyance.

Dr. Gerster called attention to the analogy between the cicatricial process and constriction, which takes place in cases like that under discussion, and in the diseased or injured urethra when for any reason the urine is diverted entirely from this channel. He had at present under his care a boy who was run over by a street-car, and whose urethra was bruised excessively. A perineal fistula was also caused by the injury, and gave vent to all the urine from the bladder. The result of this had been that the boy's urethra has become absolutely closed by cicatricial tissue. It is known that even very tight urethral strictures do not close readily as long as they are frequently called upon to permit urine to pass through them. They may become impermeable to instruments, but urine in sufficient quantity to relieve the patient will continue to pass. But divert the urine from such a cicatricial ring, it makes no difference to what other course, and the ring will close entirely. It is the same with the anastomotic ring from Murphy's button. The tendency to closure must be there, and occlusion will become absolute unless the secretions continue to pass and keep it open.